

Computing Maass cusp form on general hyperbolic torus

ABSTRACT

The bound states of a quantum mechanical system on a punctured hyperbolic torus are described by Maass cusp forms, which are eigenfunctions of the hyperbolic Laplace-Beltrami operator vanishing at infinity. In a recent work by Chan et al. (2013), the computation of Maass cusp forms makes use of the symmetric fundamental domain for the hyperbolic torus. As a result, the Maass cusp forms then are divided into odd and even classes. It is of interest to consider the case when no symmetry is assumed. This requires the expansion of Maass cusp form in its complex Fourier form. In this paper, we show the available algorithm can be extended to employ directly the complex Fourier expansion using Mathematica. We were able to reproduce the results of Chan et al, on the symmetric hyperbolic torus but now with the capability of applying the algorithm even for the case of asymmetric hyperbolic torus.

Keyword: Maass cusp; Hyperbolic torus; Symmetry